Historical perspectives of The American Association for Thoracic Surgery: Frank Gerbode (1907-1984)

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Frank Gerbode, the 53rd president of The American Association for Thoracic Surgery (AATS), was born in Placerville, California, on February 3, 1907 (Figure 1).[1,2] The last of 4 children of Frank Albert Gerbode and Anna Marie Leven, Gerbode was descended from German immigrants who came to California during the Gold Rush in the mid-1800s. Gerbode's father started a construction business, building several small factories, mining towns, and sawmills in El Dorado County. His family moved to Sacramento when Gerbode was 3 years old. Determined to become a physician and to better his chances of being admitted to a major university, he received permission from his parents to move to San Francisco to live with his older sister to complete his final 2 years of high school. Gerbode easily passed the college board examinations and attended Stanford University, where he majored in physiology. As an undergraduate working in the physiology research laboratory, he began his lifelong passion in biomedical research. After graduating with honors from Stanford University and despite his father's encouragement for him to become a businessman, Gerbode began studying at Stanford Medical School in San Francisco in 1932.

During medical school, Gerbode worked in the research laboratory of Emile Holman (33rd AATS President).[1,2] A trainee of William Halsted, Holman had established a national reputation as an investigator in the cardiovascular system and, along with the neurosurgeon F. L. Reichart, served as Gerbode's mentor in his research and future surgical endeavors. As a sophomore medical student, convinced that the cardiovascular system was the next great frontier in surgery, Gerbode chose to pursue a career in surgery. He was awarded his medical degree from Stanford in 1936 after completion of a general rotating internship at Highland Hospital in Oakland. Strongly encouraged by the Stanford surgeon Leo Eloesser (19th AATS president), Gerbode continued his surgical training at Stanford Hospital.

FIGURE 1. Photograph of Frank Gerbode (courtesy of Professor Hans Borst).

From 1936 to 1937, recognizing the importance of pathology training in becoming a surgeon, Gerbode studied under the tutelage of Germany's leading senior pathologist Max Borst in Munich.[1] Concurrent with his education in pathology, Gerbode witnessed the troubling political climate in Munich and the emergence of the Nazi Party, manifested by their open military maneuvers in the city. As the Nazi party expanded, including achieving control of scientific institutions and hospitals, Gerbode became aware of the harassment of Jews at that time and the insidious development of what was to become the persecution of Jews and the creation of concentration camps, notably Dachau outside of Munich. Because of his close relationship with Gerbode, Borst at one point intimated that his 10-year-old son Hans might be safer if Gerbode took him back to the United States.[1] This eventually was not to be, but Gerbode maintained a lifelong relationship with Hans and assisted with the latter's subsequent medical training at Harvard Medical School and as an intern at Stanford Hospital. Hans Borst later became a highly distinguished professor and director of cardiothoracic surgery at Hannover and was the first German honorary guest speaker at the AATS annual meeting in 1985. While in Munich, Gerbode was under constant surveillance by Nazi agents and the German government. Notwithstanding, Gerbode used his connections to help Jewish physicians immigrate to the United States; one such physician was Samuel Engel, who became a professor of ophthalmology at Stanford.

Gerbode returned to San Francisco to begin his surgery residency at Stanford Hospital and to work with Holman in the laboratory in 1937.[1] His experiments were focused on the treatment of cardiovascular disorders, such as patent

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ductus arteriosus, coarctation, and mitral valve disease. Gerbode served as the chief resident in surgery from 1939 to 1940, after which he joined the Stanford faculty as an instructor in surgery. Gerbode considered himself fortunate to be in surgery at "the right time," because he was engrossed in the developments in mitral surgery by such pioneers as Elliott Cutler and Sir Henry Souttar.[1]

In 1942, during World War II (WWII), Gerbode, commissioned as a major, was deployed to North Africa with the 45 other doctors and 52 nurses of the Stanford unit in the US Army Medical Corps.[1,2] Gerbode distinguished himself with his surgical skills and coordination of the logistics of the 59th Evacuation Hospital. This "mobile" hospital of 750 beds served in 6 major Army campaigns in WWII, including those in North Africa, Sicily, Anzio, southern France, central Europe, and Germany. In recognition of his service, Gerbode was promoted to lieutenant colonel and later received 6 combat medals and a unit citation. From this experience, Gerbode learned 2 valuable and pivotal lessons, specifically (1) the importance of technical expertise in performing surgery at the highest level, and (2) the importance of logistics and teamwork in the delivery of complex surgical care. In 1945, Gerbode was in southern Germany during its liberation by the American forces. Returning to Munich, he was stunned by the extent of the destruction. His saddest memory was seeing Dachau the morning after it had been liberated; the horrific scene at the concentration camp was deeply life-changing.[1] After WWII, he became a champion of Jewish causes and a major contributor to the construction of the statue commemorating the Holocaust near the Palace of the Legion of Honor in San Francisco.

On his discharge from active duty in 1945, Gerbode returned to Stanford Hospital in San Francisco.[1,2] Because his position as instructor in surgery had been eliminated during the WWII, he, at the age of 38, faced the challenge of building a surgical practice. Three milestones, namely Gross' description of the closure of a patent ductus arteriosus in 1938, Crafoord's repair of coarctation of the aorta in 1944, and Blalock's operation for the palliation of cyanotic heart disease, also in 1944, would serve as the foundation for a specialty focused on surgery of the cardiovascular system. Gerbode thus returned to the research laboratory to develop animal models of congenital heart disease. Experience in the laboratory furthered his technical ability and led Holman to ask for his assistance with congenital operations. From his experimental and clinical experience, ranging from the acute effects of pulmonic and aortic stenosis on the development of cardiac hypertrophy to the application of novel vascular anastomoses in the treatment of obstruction of the superior vena cava, Gerbode's profile in this new field of cardiovascular surgery began to rise.[2,3] In 1949, he accepted a visiting professorship at St. Bartholomew's Hospital in London, where he performed the first patent ductus repair at that institution and a variety of other congenital operations.

After his return to San Francisco in 1950, Gerbode continued to advance the treatment of mitral stenosis. Realizing the limitations of the finger fracture technique of closed mitral valvotomy, he developed a valvulotome designed to be passed through the ventricular apex.[4,5] The Gerbode valvulotome and the transventricular valvotomy became widely used for closed mitral commissurotomy. Because these closed procedures would always be limited to a select subgroup of patients, performing open cardiac surgical procedures in a safe and reproducible manner required another scientific leap. Ultimately, because the extracorporeal circuit was the essential component to open heart surgery, Gerbode worked with John Osborn on the development of a new heart-lung machine.[1] In the ensuing 18 months, Gerbode performed more than 300 open surgical procedures in the laboratory. In 1954, Gerbode performed the first clinical open heart operation west of the Mississippi, when he corrected an atrial septal defect using his newly designed heart-lung machine. Gerbode's research team, including the engineer M. L. Bramson, went on to make major contributions to the development of a membrane oxygenator, a heat exchanger to allow cooling and rewarming of the blood, and bypass circuits that reduced injury to the red blood cells and platelets.[1,2,6]

During the Korean Conflict from 1950 to 1953, Gerbode served as a lieutenant colonel in the army and a surgical consultant at Oak Knoll Naval Hospital in Oakland, California. At Oak Knoll, Gerbode operated on casualties with major arterial injuries and worked with Frank Spencer (63rd AATS President), while the latter was stationed at the hospital.[7,8] Spencer subsequently served in Korea and began to repair arteries in the field, thereby forever changing the concept of early repair of major vessels.[1,9]

In 1959, the Stanford Medical School was moved to the university campus in Palo Alto. Despite offers of leadership positions in the new institution, Gerbode elected to remain in San Francisco.[1,2] To maintain an environment of clinical research and education, Gerbode co-founded the Institutes of Medical Sciences (later known as the Medical Research Institute of San Francisco or MRI) on the site of the old Stanford Hospital. As director of the division of the Heart Research Institute of MRI, he received funding from the National Institutes of Health for research and training. MRI became one of the 10 largest private research institutes in the country, and Gerbode served as its president for 19 years and continuously as a trustee. He also began a clinical fellowship to train surgeons in the specialty of cardiovascular surgery. He believed this was a global enterprise and that training international surgeons would ensure the highest standards of practice when these surgeons returned to their home countries.[1] Gerbode regarded his impact on surgical

training as his greatest achievement; of his 88 fellows in cardiac surgery, 63 went on to become service chiefs, associate service chiefs, or professors of surgery. Professor Borst noted,

> Frank, as a representative of the leading nation in cardiovascular surgery, felt a deep obligation to train young academic surgeons around the globe. The fact that he picked a multitude of fellows who later became leaders in his field bespeaks his intimate knowledge of the international scene. I myself, like Frank, consider this his greatest achievement, because his pupils learnt from him not only cardiovascular curiosity and actual surgery, but also the qualities of American academic leadership, which they carried home (personal communication, August 6, 2013).

In the early 1960s, in addition to his work in establishing the research institutes, Gerbode secured funding for the building of the Pacific Presbyterian Medical Center. During the design of the new hospital, Gerbode collaborated with IBM president Thomas Watson to develop the first computerized hospital monitoring system in the United States.[1,10] The major focus was the use of computers for patient monitoring in the intensive care unit, with blood pressure, heart rate, arterial blood gases, and pulmonary function presented on a single monitor display. This project involved the earliest applications of computers to clinical medicine; its ongoing development was a major focus of Gerbode's for the remainder of his career. At his AATS presidential address in 1973, Gerbode outlined the development and future of computerized monitoring of important physiologic parameters in a seriously ill patient, a process that enabled more informed decision making in patient care.[10] He summarized his efforts by noting: "The seriously ill patient has many labile physiological abnormalities which need to be monitored simultaneously and frequently in order to guide his treatment intelligently. It is our belief that this is best supplied by an on-line computerized system. One has to have and use many instruments to fly a complicated airplane through a storm at night."[10]

Martha Alexander was born in Piedmont, California, in 1909, and graduated from Stanford University. The only child of Wallace and Mary Alexander, Martha met Gerbode in the experimental psychology class at Stanford, and they were married in 1931 in his last undergraduate year.[1] Devoted to her family and driven by an internal sense of social responsibility, Martha was philanthropically committed to nature and land conservation and the area of personal choice.[1,11] Land use, Planned Parenthood, and the Young Women's Christian Association (YWCA) took on a new dimension with her financial support and leadership. One of their sons, Wallace Alexander Gerbode, born in 1933, was 19 years old and a sophomore at Stanford when he was killed in an automobile accident near campus. The Gerbodes established the Wallace Alexander Gerbode Foundation in his memory to benefit projects in the Bay Area and in Hawaii.[1] The foundation has made contributions to the Nature Conservancy, civil rights, minorities, and music and drama organizations. Their daughter Maryanna noted, "Martha, through her own financial and personal means, was able to achieve what many nonprofits and corporations are today striving to accomplish. Hopefully with some of her many activities…, future generations will realize the examples she set during her lifetime of tenacity and dedication with the heart of a true humanitarian."[11] A very compassionate and vibrant individual, Martha died in 1971. After Gerbode's retirement in 1980, he remained active as the director of the Heart Research Institute and a board member of MRI, the Pacific Medical Center, and the Gerbode Foundation. In his free time, he enjoyed photography, carpentry, sailing, skiing, duck hunting, and painting. Gerbode died unexpectedly on December 6, 1984, and was survived by 2 daughters, Maryanna and Penelope, 2 sons, Frank and Philip, and many grandchildren.

Gerbode's 40 years in research, surgery and teaching have been preserved in his writings, which include nearly 300 scientific manuscripts, monographs, and chapters.[1,2] Gerbode made important contributions to the repair of tetralogy of Fallot and endocardial cushion defects and was among the first to describe the techniques of valvuloplasty and annuloplasty in the correction of mitral valve insufficiency. His writings span the breadth of the development of cardiovascular surgery, not only the technical description of surgical procedures, but also the supporting infrastructure, including blood banking, intensive care, and extracorporeal circulation. He helped to standardize the dosing of protamine to neutralize the heparin used during extracorporeal circulation and was the first surgeon in the United States to use a volume respirator during and after heart surgery. Additionally, Gerbode was one of the first to promote the use of a median sternotomy for cardiac surgery in contrast to the bilateral transverse sternotomy.[1,12] In 1958, he published a series of 5 patients who had undergone successful surgical correction of left ventricular to right atrial shunts; thereafter, a direct communication between the left ventricle and the right atrium became known as the Gerbode defect.[13]

Gerbode's independence, self-confidence, generosity, willingness to challenge established medical dogma, good humor, and innovative mind made him uniquely suited to be a pioneer in cardiovascular surgery. His colleague J. Donald Hill reminisced, "My fondest memories of Dr Gerbode are his optimism, his contemporary attitude toward change, his will to be the best at what he did, and his superb intraoperative judgment of knowing what will

work, combined with his technical mastery of carrying it out. His legacy for young surgeons encompassed much besides his being a generous benefactor of many public and educational causes that will serve many people for the years to come.''[2] Norman Shumway (67th AATS president) once noted, ''As Frank would say, 'Life goes on,' so it is left for the rest of us to do our best and hope that its performance will come close to the standard that he established for us.''[1]

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